

**What is claimed is:**

1. A resistor comprising:  
a resistor element made of metal sheet; and  
terminals made of different metal and electrically connected to both  
5 ends of said metal sheet resistor element,  
wherein said terminal is made of a material having electrical  
conductivity not less than that of said resistor element.
2. The resistor as defined in Claim 1, wherein said resistor element is  
10 corrugated in a thickness direction of the metal sheet.
3. The resistor as defined in one of Claims 1 and 2, wherein said  
terminal has a groove of a width equivalent to a thickness of said resistor element,  
and said terminal has a width not less than a width of said resistor element, and a  
15 length shorter than a length of said resistor element.
4. A resistor comprising:  
a resistor element made of metal sheet;  
an insulating sheet disposed at least on one of top face and bottom  
20 faces of said resistor element; and  
a terminal having a concave groove of a width equivalent to a sum of  
a thickness of said resistor element and a thickness of said insulating sheet, said  
terminal being electrically connected to said resistor element.

5. The resistor as defined in Claim 4, wherein said terminal has a groove of a width equivalent to the sum of the thickness of said resistor element and the thickness of said insulating sheet, and said terminal has a thickness thicker than a sum of the thickness of said resistor element and the thickness of said insulating sheet,  
5 a width not less than a width of said resistor element, and a length shorter than a length of said resistor element.

6. A resistor comprising:  
a resistor element made of metal wire; and  
10 a metal terminal having a concave groove covering both ends of said resistor element; said terminal being electrically connected to said resistor element.

7. A resistor comprising:  
a resistor element made of metal wire, said resistor element being bent  
15 into a cylindrical coil shape; and  
a metal terminal having a concave groove covering both ends of said resistor element, said terminal being electrically connected to said resistor element.

8. A resistor comprising:  
20 a resistor element made of metal wire, said resistor element being bent symmetrically to the left and right in one plane; and  
a metal terminal having a concave groove covering both ends of said resistor element, said terminal being electrically connected to said resistor element.

25 9. A resistor comprising:

a plurality of resistor elements made of metal wire, said resistor elements being aligned not to electrically contact each other; and

a metal terminal having a concave groove covering both ends of said resistor elements, said terminal being electrically connected to said resistor elements.

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10 10. The resistor as defined in one of Claims 6, 7, 8, and 9, wherein said terminal has a groove of a width equivalent to one of a thickness and diameter of said resistor element; said terminal has a thickness thicker than a total thickness of said resistor elements, a width not less than a width of said resistor element, and a length shorter than a length of said resistor element.

11. A resistor comprising:

a resistor element made of metal sheet; and

15 a metal terminal disposed at both ends of said resistor element, said terminal being electrically connected to said resistor element and having an L shape section face.

12. The resistor as defined in Claim 11, wherein a thickness of a portion of said terminal underneath said resistor element is thicker than that of a portion of said terminal contacting an end face of said resistor element.

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13. A resistor comprising:

a resistor made of metal sheet:

an insulating sheet attached to at least one of top and bottom faces of  
25 said resistor element; and

a metal terminal disposed at both ends of said resistor element, said terminal being electrically connected to said resistor element and having an L shape section face.

5                   14. A resistor comprising:

a metal resistor element provided with a step between both ends by making a thickness of said both ends thicker than a central portion; and

10                   a metal terminal disposed at both ends of said resistor element, said terminal having a one-side-open section face with an inner space broader than its opening, and being electrically connected to said step of said resistor element at least at said inner space of the opening.

15                   15. A resistor comprising:

a resistor element made of metal sheet;

15                   an insulating substrate; and

a metal terminal formed in a way to electrically connect top and bottom faces of said insulating substrate at both ends, said terminal on the top face of said insulating substrate being electrically connected to said resistor element.

20                   16. A resistor comprising:

a resistor element made of metal sheet;

an insulating substrate; and

25                   four metal terminals formed in a way to electrically connect top and bottom faces of said insulating substrate, said terminal on a top face of said insulating substrate being electrically connected to said resistor element.

17. The resistor as defined in one of Claims 15 and 16, wherein said insulating substrate is one of a glass impregnated epoxy resin substrate and paper impregnated phenolic resin substrate.

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18. A resistor comprising:

a metal resistor; and

four metal terminals, said terminals being disposed one each on top and bottom faces at both ends of said resistor element, and electrically connected to

10 said resistor element.

19. The resistor as defined in Claim 18, wherein a width of said terminals are not less than a width of said resistor element.

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20. The resistor element as defined in Claim 18, wherein said terminals disposed on top and bottom faces at both ends of said resistor element are electrically connected to each other.

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21. A resistor comprising:

a metal resistor element having a notch near both ends; and

a metal terminal disposed at both ends of said resistor element, said terminal having a protrusion corresponding to said notch;

wherein said resistor element and said terminal are electrically connected at least through said protrusion and said notch.

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22. A resistor comprising:

a metal resistor element having at least two through holes; and  
a metal terminal having at least one protrusion with a same shape as  
said through holes;

5                    wherein at least one protrusion of said terminal is inserted to at least  
one through hole of said resistor element, and at least one face of said terminal is  
electrically connected to said resistor element.

23. The resistor as defined in one of Claims 4, 6, 7, 8, and 9, wherein  
10    said groove of said terminal has a concave shape equivalent to a section face in a  
shorter side of one of said resistor element and a sum of said resistor element and  
insulating sheet, said groove being created for the number of resistor elements.

24. The resistor as defined in one of Claims 1, 2, 4, 6, 7, 8, and 9,  
15    wherein a thickness of said terminal is at least three times of that of said resistor  
element.

25. The resistor as defined in one of Claims 1, 2, 4, 6, 7, 8, 9, 11, 13,  
14, 18, 20, 21, and 22, wherein a second conductive metal is interposed between said  
20    resistor element and said terminal.

26. The resistor as defined in one of Claims 1, 2, 4, 6, 7, 8, 9, 14, 18,  
20, and 22, wherein a protective film is formed on said resistor element.

27. The resistor as defined in Claim 26, wherein said protective film is leveled with top and bottom faces of said terminal, and formed within a width of said terminal.

5                   28. A method for manufacturing a resistor comprising:  
                  forming a resistor element made of metal sheet, said resistor element  
                  having a shape adjusted to obtain a predetermined resistance;  
                  forming a block of metal terminal having a concave groove; and  
                  electrically connecting said terminal and said resistor element by  
10   fitting said concave groove of said terminal to both ends of said resistor element.

                  29. A method for manufacturing a resistor comprising:  
                  forming a resistor element made of metal wire, said resistor element  
                  being adjusted to obtain a predetermined resistance;  
15                  machining said resistor element into a predetermined shape;  
                  forming a block of metal terminal having a concave groove; and  
                  electrically connecting said terminal and said resistor element by  
                  fitting said concave groove of said terminal to both ends of said resistor element.

20                  30. A method for manufacturing a resistor comprising:  
                  forming a terminal made of a metal foil pattern with a predetermined  
                  shape, top and bottom faces of said terminal being electrically connected to a part of  
                  top, side, and bottom faces of an insulating substrate;  
                  dividing said insulating substrate into a predetermined shape;

forming a metal resistor element, said resistor element having a shape adjusted to obtain a predetermined resistance;

electrically connecting said resistor element to the metal foil pattern on the top face of said insulating substrate.

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31. A method for manufacturing a resistor comprising:

forming a metal resistor element, said resistor element being adjusted to obtain a predetermined resistance;

forming a block of metal terminal having at least one protrusion;

10 creating at least two through holes at a predetermined position of said resistor element;

inserting at least one of said protrusion into at least one of said through hole;

15 bending an open side of said terminal to hold said resistor in a thickness direction; and

electrically connecting said resistor element and said terminal.

32. The method for manufacturing a resistor as defined in one of Claims 28, 29, and 31, wherein said terminal is electrically connected to both ends of  
20 said resistor element by one of pressing and caulking after fitting said concave groove to both ends of said resistor element.

33. The method for manufacturing a resistor as defined in one of Claims 28, 29, 30, and 31, wherein said step of electrically connecting said resistor  
25 element and said terminal comprises the steps of:



inserting a metal foil between said resistor element and said terminal;  
and

connecting said resistor element and said terminal by one of brazing,  
pressing, and ultrasonic welding said resistor element, metal, and terminal.

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34. The method for manufacturing a resistor as defined in one of  
Claims 28, 29, 30, and 31, wherein said step of electrically connecting said resistor  
element and terminal comprises the steps of:

coating said at least one of said resistor element and terminal with  
10 metal different from that used for forming said resistor element and said terminal;

connecting said resistor element and said terminal, after assembling  
coated resistor element and terminal, by one of brazing, pressing, and ultrasonic  
welding.

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35. A method for manufacturing a resistor comprising:

a metal resistor element, said resistor element having a shape adjusted  
to obtain a predetermined resistance;

forming one of a notch and groove at a predetermined position of said  
resistor element;

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forming a block of metal terminal with a predetermined shape, said  
terminal having at least one protrusion;

sandwiching said resistor element with said terminal, and inserting  
said protrusion into one of said notch and groove; and

electrically connecting said resistor element and said terminal.

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36. A method for manufacturing a resistor comprising:

a resistor element made of metal sheet, said resistor element having a shape adjusted to obtain a predetermined resistance, and having one of at least two through holes, notches, grooves, and cavities;

5           forming a terminal made of metal strip, said terminal being one of sandwiched and folded on top, bottom, and side faces at both ends of said resistor element, and a part of metal being inserted and fixed to one of said through holes, notches, grooves, and cavities of said resistor element; and  
            electrically connecting said resistor element and said terminal.

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37. A resistor comprising:

a resistor element made of metal sheet;

a concave terminal whose entire face is coated with metal having a low melting point, said terminal being disposed at both ends of said resistor element  
15   through a groove of said terminal, and being electrically connected to said resistor element through said metal having a low melting point in said groove; and  
            an insulating film covering entire face of said resistor element  
            excluding said terminal.

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38. The resistor as defined in Claim 37, wherein said terminal has a thickness thicker than a thickness of said resistor element, a width not less than a width of said resistor element, and a length shorter than a length of said resistor element.

39. The resistor as defined in one of Claims 37 and 38, wherein electrical conductivity of said terminal is greater than electrical conductivity of said resistor element.

5                   40. The resistor as defined in Claim 37, wherein a thickness of said insulating protective film is leveled with top and bottom faces of said terminal, and a width of said insulating protective film is within a width of said terminal.

                  41. A method for manufacturing a resistor comprising:  
10                   a first step of forming a terminal by processing a concave metal terminal and then coating entire face of said terminal with metal having a low melting point;  
                  a second step of forming a resistor element made of metal sheet whose shape is adjusted to obtain a predetermined resistance;  
15                   a third step of electrically connecting said resistor element and said terminal by cold forging said terminal after covering both ends of said resistor element with said terminal, heating, and cooling;  
                  a fourth step of forming an insulating protective film having a predetermined shape on entire face of said resistor element excluding said terminal.

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                  42. The method for manufacturing a resistor as defined in Claim 41, wherein said first step of forming said terminal is implemented after said second step of forming said resistor element.

43. The method for manufacturing a resistor as defined in Claim 41, wherein a step of trimming resistor element is added between said third step of electrically connecting said resistor element and said terminal, and said fourth step of forming said insulating protective film.